Math 1
Exam 7 Review

Exam 7 will be on Wednesday, May 3 All of the standards from module seven are on the exam:

- **7A**: **coordinate computation** Students use coordinates for computational purposes.
- **7B**: **loci** Students translate between geometric objects on a coordinate plane and their equations.
- **7C**: **coordinate proof** Students use coordinates to prove geometric theorems algebraically.
- **7D**: **function transformation** Students understand and use geometric transformations of functions to produce new functions.
- **7E**: **vectors** Students understand and use vectors and vector arithmetic.
- **7F**: **matrix properties** Students understand and use properties of matrix arithmetic (including identity, inverse, associative, and commutative).
- **7G**: **determinant** Students calculate and interpret determinants of 2×2 matrices.

The instructions on the exam are:

> For all problems, show all work. You may use a graphing calculator. Do not round. If you use scratch paper, turn it in along with the exam.

Fun Facts and Formulas

Distance Between Points. The distance between (x_1, y_1) and (x_2, y_2) is

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

Instead of memorizing this formula, it is *much* easier just to use the Pythagorean Theorem.

Equation of a Circle. The equation of a circle with center (h, k) and radius r is

$$(x - h)^2 + (y - k)^2 = r^2.$$

Vertical Shift. A vertcial shift of f is of the form

$$g(x) = f(x) + k$$

for some $k \in \mathbb{R}$. If $k > 0$, then g is a shift of f up k units. If $k < 0$, then g is a shift of f down $|k|$ units.

Horizontal Shift. A horizontal shift of f is of the form

$$g(x) = f(x + k)$$

for some $k \in \mathbb{R}$. If $k > 0$, then g is a shift of f left k units. If $k < 0$, then g is a shift of f right $|k|$ units.

There are more fun facts and formulas on the back. ☺

Linear Combinations of Vectors. If $\vec{u} = \langle a, b\rangle$ and $\vec{v} = \langle x, y\rangle$, then

$$r\vec{u} + s\vec{v} = \langle ra + sx, rb + sy\rangle.$$

Magnitude. If $\vec{v} = \langle x, y\rangle$, then the magnitude of $\vec{v}$ is

$$\|\vec{v}\| = \sqrt{x^2 + y^2}.$$

Radical Issues. Beware of the following:

$$\sqrt{m} + \sqrt{n} \neq \sqrt{m + n}$$

Magnitude Issues. Beware of the following:

$$\|\vec{u} + \vec{v}\| \neq \|\vec{u}\| + \|\vec{v}\|$$

Determinant. The determinant of $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $ad - bc$.

Area of a Parallelogram. If $\langle a, c\rangle$ and $\langle b, d\rangle$ are distinct vectors that emanate from the same vertex of a parallelogram, then the area of the parallelogram is $|ad - bc|$.

Inverse of a Matrix. A matrix has an inverse if and only if its determinant is nonzero. The following formula yields the inverse of a 2×2 matrix:

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$